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LAW OFFICES
YOUNG & BASILE, P.C.

YOUNG, BASILE, HANLON,
MACFARLANE, WOOD & HELMHOLDT, P.C.

PATENTS, TRADEMARKS AND COPYRIGHTS
3001 WEST BIG BEAVER ROAD
SUITE 624
TROY, MICHIGAN 48064-3107

TELEPHONE (248) 649-3333
FACSIMILE (248) 649-3338

June 1, 2000

2001 COMMONWEALTH BLVD.
SUITE 301
ANN ARBOR, MI 48105-1562
TELEPHONE (734) 662-0270
FACSIMILE (734) 662-1014

700 HARRIS BUILDING
JACKSON, MI 49201
TELEPHONE (517) 787-4511
FACSIMILE (517) 787-4512
DUNCAN F. BEAMAN, RESIDENT ATTORNEY
TOWNSEND F. BEAMAN (1931-1983)

MT. CLEMENS
(810) 469-1141

GRAND RAPIDS
(616) 942-2324

* ALSO LICENSED IN MINNESOTA

Attorney's Docket: AE057 (VAL-441-A)
Box PATENT APPLICATION
Assistant Commissioner of Patents
Washington, D.C. 20231

EXPRESS MAIL LABEL NO.:

EL516817127US

jc571 U.S. PTO
09/585515

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Sir:

Enclosed please find an application for U.S. Patent as identified below.

Inventor: Donald Bruce Moote

Invention: **LOW ACCELERATION SYMMETRICAL OVERLAP WIPER
SYSTEM**

and including: Postcard; Application including Abstract, Specification,
and claims; 11 sheets of informal drawings; Combined Declaration And Power of
Attorney; Information Disclosure Statement; Form PTO-1449 with the cited
patents.

Filing Fee: \$690.00

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WOOD & HELMHOLDT, P.C.


Thomas D. Helmholdt
Helmholdt@ybpcc.com

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PATENT

FIELD OF THE INVENTION

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The present invention relates to a windshield wiper mechanism including a pair of oscillated wiper blades having an overlapping wiping pattern at an inboard stroke end so as to substantially increase the

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connected at one end to a fourth crank arm of the idler pivot link, and is pivotally connected at an opposite end for driving a second one of the pair of spaced wiper shafts. Alternatively, a fourth elongate link can be pivotally connectable at one end to the crank arm of the rotary drive member and pivotally connectable at an opposite end for driving a second one of the pair of spaced wiper shafts.

In a windshield wiper drive system according to the present invention for imparting overlapping butterfly oscillation to a pair of spaced wiper shafts, an idler pivot link is connectable to at least one of the pair of spaced wiper shafts for imparting lower acceleration oscillation in proximity to a reversal position of each connected wiper shaft then the acceleration imparted intermediate a parked position and the reversal position of each connected wiper shaft. The idler pivot link is rotatable about a fixed axis and is connectable to at least one of the spaced wiper shafts for imparting a dwell in oscillation in proximity to a parked position of at least one of the connected wiper shafts.

Other objects, advantages and applications of the present invention will become apparent to those skilled in the art when the following description of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein:

Figure 1 is a perspective view of a windshield wiper drive system according to the present invention for imparting overlapping butterfly oscillation to a pair of spaced wiper shafts from a rotary drive member having a crank arm;

Figure 2 is a schematic representation of a windshield showing the wiped areas resulting from the overlapping butterfly oscillation of the pair of spaced wiper shafts with a nominal position and a high speed position noted at the outer ends of the wiped area for each wiper;

Figure 3 is a detailed plan view of the windshield wiper drive with the wiper in the outer position;

Figure 4 is a detailed view of the windshield wiper drive with the wiper in an intermediate position;

Figure 5 is a detailed view of the windshield wiper drive with the wiper in an inner position;

Figure 6 is a side elevational view of the idler pivot link according to the present invention;

Figure 7 is a plan view of an alternative configuration of the windshield wiper drive according to the present invention with the windshield wiper in the outer position;

Figure 8 is a detailed view of the windshield wiper drive of Fig. 7 with the windshield wiper in the outermost oscillatory position;

Figure 9 is a detailed view of the windshield wiper drive of Fig. 8 with the wiper oscillated to an intermediate position;

Figure 10 is a detailed view of the windshield wiper drive of Fig. 8 with the wiper oscillated to an inner position; and

Figure 11 is a side elevational view of the idler pivot link for the windshield wiper drive of Fig. 8.

DESCRIPTION OF THE PREFERRED AND ALTERNATIVE EMBODIMENTS

Referring now to Figs. 1-6, a windshield wiper drive 10 is illustrated for imparting overlapping butterfly oscillation to a pair of spaced wiper shafts 12, 14 from a rotary drive member 16 having a crank arm

18. A drive link 20 is provided having first, second, and third connection points 22, 24, and 26 respectively. The first connection point 22 is disposed adjacent one end 28 of the drive link 20 and is pivotally connectable to the crank arm 18 of the rotary drive member 16. The second connection point 24 is disposed adjacent an opposite end 30 of the drive link 20. The third connection point 26 is interposed between the first connection point 22 and the second connection point 24 along the drive link 20.

Idler pivot link means 32 is connectable to at least one of the pair of spaced wiper shafts 12, 14 for imparting lower acceleration oscillation in proximity to a nominal reversal position 34a, 34b of each connected wiper shaft 12, 14 than the acceleration imparted intermediate an inner position 36a, 36b and the reversal position 34a, 34b of each connected wiper shaft 12, 14. The idler pivot means 32 is rotatable about a fixed axis 38 and is connectable to at least one of the pair of spaced wiper shafts 12, 14 for imparting a dwell in oscillation in proximity to the parked position 36a, 36b of the at least one of the connected wiper shafts 12, 14. The idler pivot link means 32 can include an idler pivot link 40 pivotable about the fixed axis 38 and having at least three crank arms 42, 44, 46 extending radially from the fixed axis 38 and spaced from one another. A first elongate link 48 is pivotally connected at one end 50 to a first crank arm 42 of the idler pivot link 40 and is pivotally connected at an opposite end 52 to the second connection point 24 of the drive link 20. A second elongate link 54 is pivotally connected at one end 56 to a second crank arm 44 of the idler pivot link 40 and is pivotally connected at an opposite end 58 to the third connection point 26 of the drive link 20. The first and second elongate links 48, 54 cross with respect to one another between the idler pivot link 40 and the drive link 20. A third elongate link 60 is pivotally connected

at one end 62 to a third crank arm 46 of the idler pivot link 40 and is pivotally connectable at an opposite end 64 for driving a first one of the pair of spaced wiper shafts 12, 14.

5 If both spaced wiper shafts 12, 14 are to be driven by the windshield wiper drive 10 according to the present invention, the idler pivot link 40 can include a fourth crank arm 66, and a fourth elongate link 68 can be pivotally connected at one end 70 to the fourth crank arm 10 66 of the idler pivot link 40 and can be pivotally connectable at an opposite end 72 for driving a second one of the pair of spaced wiper shafts 12, 14. Alternatively, as best seen in Figs. 7-11, a fourth elongate link 168 can be pivotally connectable at one end 15 170 to the crank arm 118 of the rotary drive member 116 and can be pivotally connectable at an opposite end 172 for driving a second one of the pair of spaced wiper shafts 112, 114.

In the preferred configuration, the first, 20 second, and third crank arms 42, 44, 46 of the idler pivot link 40 are spaced angularly from one another about the fixed axis 38. The fixed axis 38 of rotation for the idler pivot link 40 is spaced from the wiper shafts 12, 14. The wiper drive system according to the present 25 invention provides low acceleration, symmetrical overlap of the wiper blade sweep area. This type of system is sometimes referred to as a butterfly system. Current symmetrical overlap systems must have the top wiper arm start with a high acceleration to move the upper wiper 30 arm out of the way prior to the bottom wiper arm movement. In addition, the upper wiper arm in current systems is required to finish slowly. The bottom arm in current systems must start with a low acceleration and finish with a high acceleration. This movement causes 35 the bottom arm to have large pattern growth due to high acceleration adjacent the reversal position for current systems, allowing the arm to strike the car body at the

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pillar. The top arm also has a tendency to strike the bottom arm in current systems when the top arm returns to the parked position. The present invention allows the top wiper arm to have a normal wipe motion and dwells the bottom wiper arm prior to allowing the bottom wiper arm to proceed with normal motion. The present invention makes use of a cross linkage design, sometimes referred to as a "Tchbeysheff" cross linkage, to allow the idler pivot to have a much greater turning angle allowing the linkage to dwell until the other arm moves out of the way before proceeding in a normal motion.

Referring now to Figs. 7-11, an alternative embodiment of the windshield wiper device 110 according to the present invention is illustrated. The windshield wiper drive 110 imparts overlapping butterfly oscillation to a pair of spaced wiper shafts 112, 114 from a rotary drive member 116 having a crank arm 118. A drive link 120 is disclosed having first, second, and third connection points 122, 124, 126 respectively. The first connection point 122 is disposed adjacent one end 128 of the drive link 120 and is pivotally connectable to the crank arm 118 of the rotary drive member 116. The second connection point 124 is disposed adjacent an opposite end 130 of the drive link 120. The third connection point 126 is interposed between the first connection point 122 and the second connection point 124 along the drive link 120.

Idler pivot link means 132 is connectable to at least one of the pair of spaced wiper shafts 112, 114 for imparting lower acceleration oscillation in proximity to a reversal position 34a, 34b (shown in Fig. 2) of each connected wiper shaft 112, 114 than the acceleration imparted intermediate an inner position 36a, 36b (Fig. 2) and the reversal position 34a, 34b of each connected wiper shaft 112, 114. The idler pivot link means 132 is rotatable about a fixed axis 138 and is connectable to at least one of the pair of spaced wiper shafts 112, 114 for

imparting a dwell in oscillation in proximity to the inner position 36a, 36b of the at least one of the connected wiper shafts 112, 114. The idler pivot link means 132 can include an idler pivot link 140 pivotable about the fixed axis 138 and having at least three crank arms 142, 144, 146 extending radially from the fixed axis 138 and spaced from one another. A first elongate link 148 is pivotally connected at one end 150 to a first crank arm 142 of the idler pivot link 140 and is pivotally connected at an opposite end 152 to the second connection point 124 of the drive link 120. A second elongate link 154 is pivotally connected at one end 156 to a second crank arm 144 of the idler pivot link 140 and is pivotally connected at an opposite end 158 to the third connection point 126 of the drive link 120. The first and second elongate links 148, 154 cross with respect to one another between the idler pivot link 140 and the drive link 120. A third elongate link 160 is pivotally connected at one end 162 to a third crank arm 146 of the idler pivot link 140 and is pivotally connectable at an opposite end 164 for driving a first one of the pair of spaced wiper shafts 112, 114.

If both spaced wiper shafts 112, 114 are to be driven by the windshield wiper drive 110 according to the present invention, a fourth elongate link 168 can be provided to be pivotally connectable at one end 170 to the crank arm 118 of the rotary drive member 116, and pivotally connectable at an opposite end 172 for driving a second one of the pair of spaced wiper shafts 112, 114. Alternatively, as shown in Figs. 1-6, a fourth elongate link 68 can be provided to be pivotally connected at one end 70 to a fourth crank arm 66 formed on the idler pivot link 40 and pivotally connectable at an opposite end 72 for driving a second one of the pair of spaced wiper shafts 12, 14.

The first, second, and third crank arms 142, 144, 146 of the idler pivot link 140 preferably are

spaced angularly from one another about the fixed axis 138. The fixed axis 138 of rotation for the idler pivot link 140 is spaced from the wiper shafts 112, 114. The idler pivot link 40, or 140, allows a greatly increased turning angle to permit the linkage to dwell until the other arm moves out of the way before proceeding in a normal motion. This eliminates the high acceleration of the bottom wiper arm at the reversal position and substantially reduces the pattern growth at high oscillation speeds to prevent the wiper arm from striking the car body at the pillar. The present invention allows the top wiper arm to have a normal wipe motion and dwells the bottom wiper arm prior to allowing the bottom wiper arm to proceed with a normal wipe motion.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.

What is claimed is:

1 1. A windshield wiper drive for imparting
2 overlapping butterfly oscillation to a pair of spaced
3 wiper shafts from a rotary drive member having a crank
4 arm comprising:

5 a drive link having first, second, and third
6 connection points, the first connection point adjacent
7 one end of the drive link and pivotally connectible to
8 the crank arm of the rotary drive member, the second
9 connection point adjacent an opposite end of the drive
10 link, and the third connection point interposed between
11 the first connection point and the second connection
12 point along the drive link;

13 an idler pivot link pivotable about a fixed
14 axis and having at least three crank arms extending
15 radially from the fixed axis and spaced from one another;

16 a first elongate link pivotally connected at
17 one end to a first crank arm of the idler pivot link and
18 pivotally connected at an opposite end to the second
19 connection point of the drive link;

20 a second elongate link pivotally connected at
21 one end to a second crank arm of the idler pivot link and
22 pivotally connected at an opposite end to the third
23 connection point of the drive link, the first and second
24 elongate links crossing with respect to one another; and

25 a third elongate link pivotally connected at
26 one end to a third crank arm of the idler pivot link and
27 pivotally connectible at an opposite end for driving a
28 first one of the pair of spaced wiper shafts.

1 2. The windshield wiper drive of claim 1
2 further comprising:

3 the idler pivot link having a fourth crank arm;
4 and

5 a fourth elongate link pivotally connected at
6 one end to the fourth crank arm of the idler pivot link

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3 a rotary drive member having a crank arm
4 connectible to the idler pivot link means for driving the
5 idler pivot link means in rotation about a fixed axis.

1 10. The improvement of claim 9 further
2 comprising:
3 the idler pivot link having a fourth crank arm;
4 and
5 a fourth elongate link pivotally connected at
6 one end to the fourth crank arm of the idler pivot link
7 and pivotally connectible at an opposite end for driving
8 a second one of the pair of spaced wiper shafts.

1 11. The improvement of claim 9 further
2 comprising:
3 a fourth elongate link pivotally connectible at
4 one end to the crank arm of the rotary drive member and
5 pivotally connectible at an opposite end for driving a
6 second one of the pair of spaced wiper shafts.

1 12. The improvement of claim 9 further
2 comprising:
3 the first, second, and third crank arms of the
4 idler pivot link spaced angularly from one another about
5 the fixed axis.

1 13. The improvement of claim 9 further
2 comprising:
3 the fixed axis of rotation for the idler pivot
4 link spaced from the wiper shafts.

1 14. In a windshield wiper drive system for
2 imparting overlapping butterfly oscillation to a pair of
3 spaced wiper shafts, the improvement comprising:
4 idler pivot link means rotatable about a fixed
5 axis and connectible to at least one of the pair of
6 spaced wiper shafts for imparting a dwell in oscillation
7 in proximity to a park position of the at least one of
8 the connected wiper shafts.

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1 15. The improvement of claim 14 further
2 comprising:

3 a rotary drive member having a crank arm
4 connectible to the idler pivot link means for driving the
5 idler pivot link means in rotation about the fixed axis.

1 16. The improvement of claim 14 wherein the
2 idler pivot link means further comprises:

3 a drive link having first, second, and third
4 connection points, the first connection point adjacent
5 one end of the drive link and pivotally connectible to a
6 crank arm of a rotary drive member, the second connection
7 point adjacent an opposite end of the drive link, and the
8 third connection point interposed between the first
9 connection point and the second connection point along
10 the drive link;

11 an idler pivot link pivotable about a fixed
12 axis and having at least three crank arms extending
13 radially from the fixed axis and spaced from one another;

14 a first elongate link pivotally connected at
15 one end to a first crank arm of the idler pivot link and
16 pivotally connected at an opposite end to the second
17 connection point of the drive link;

18 a second elongate link pivotally connected at
19 one end to a second crank arm of the idler pivot link and
20 pivotally connected at an opposite end to the third
21 connection point of the drive link, the first and second
22 elongate links crossing with respect to one another; and

23 a third elongate link pivotally connected at
24 one end to a third crank arm of the idler pivot link and
25 pivotally connectible at an opposite end for driving a
26 first one of the pair of spaced wiper shafts.

1 17. The improvement of claim 16 further
2 comprising:

3 the idler pivot link having a fourth crank arm;
4 and

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ABSTRACT OF THE DISCLOSURE

A windshield wiper drive imparts overlapping butterfly oscillation to a pair of spaced wiper shafts from a rotary drive member having a crank arm. A drive link is provided having first, second, and third connection points. The first connection point is adjacent one end of the drive link and is pivotally connectable to the crank arm of the rotary drive member. The second connection point is adjacent an opposite end of the drive link, and the third connection point is interposed between the first connection point and the second connection point along the drive link. An idler pivot link is pivotable about a fixed axis and has at least three crank arms extending radially from the fixed axis and spaced from one another. A first elongate link is pivotally connected at one end to a first crank arm of the idler pivot link, and is pivotally connected at an opposite end to the second connection point of the drive link. A second elongate link is pivotally connected at one end to a second crank arm of the idler pivot link, and is pivotally connected at an opposite end to the third connection point of the drive link. The first and second elongate links cross with respect to one another between the idler pivot link and the drive link. A third elongate link is pivotally connected at one end to a third crank arm of the idler pivot link, and is pivotally connectable at an opposite end for driving a first one of the pair of spaced wiper shafts.

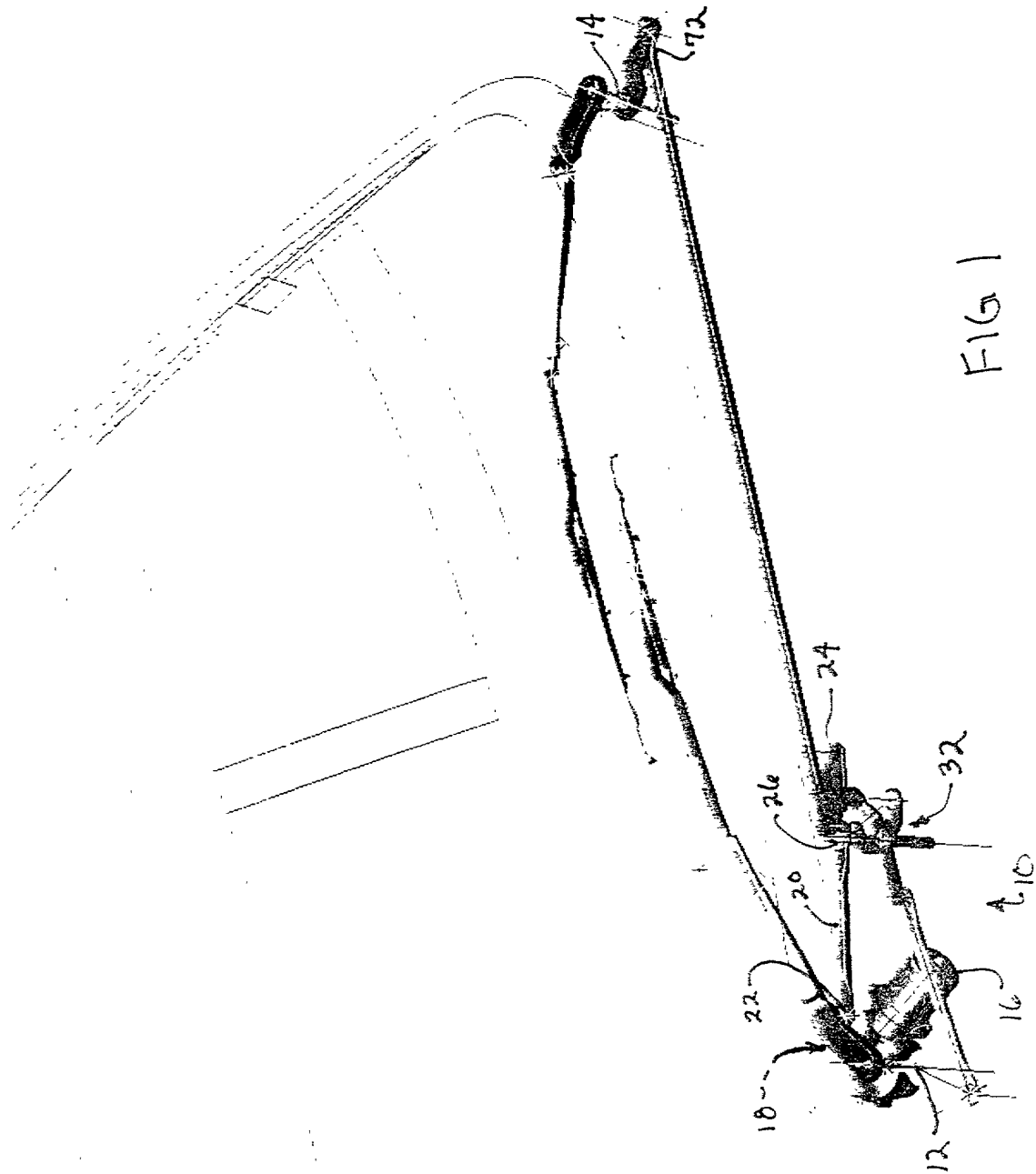


FIG 1

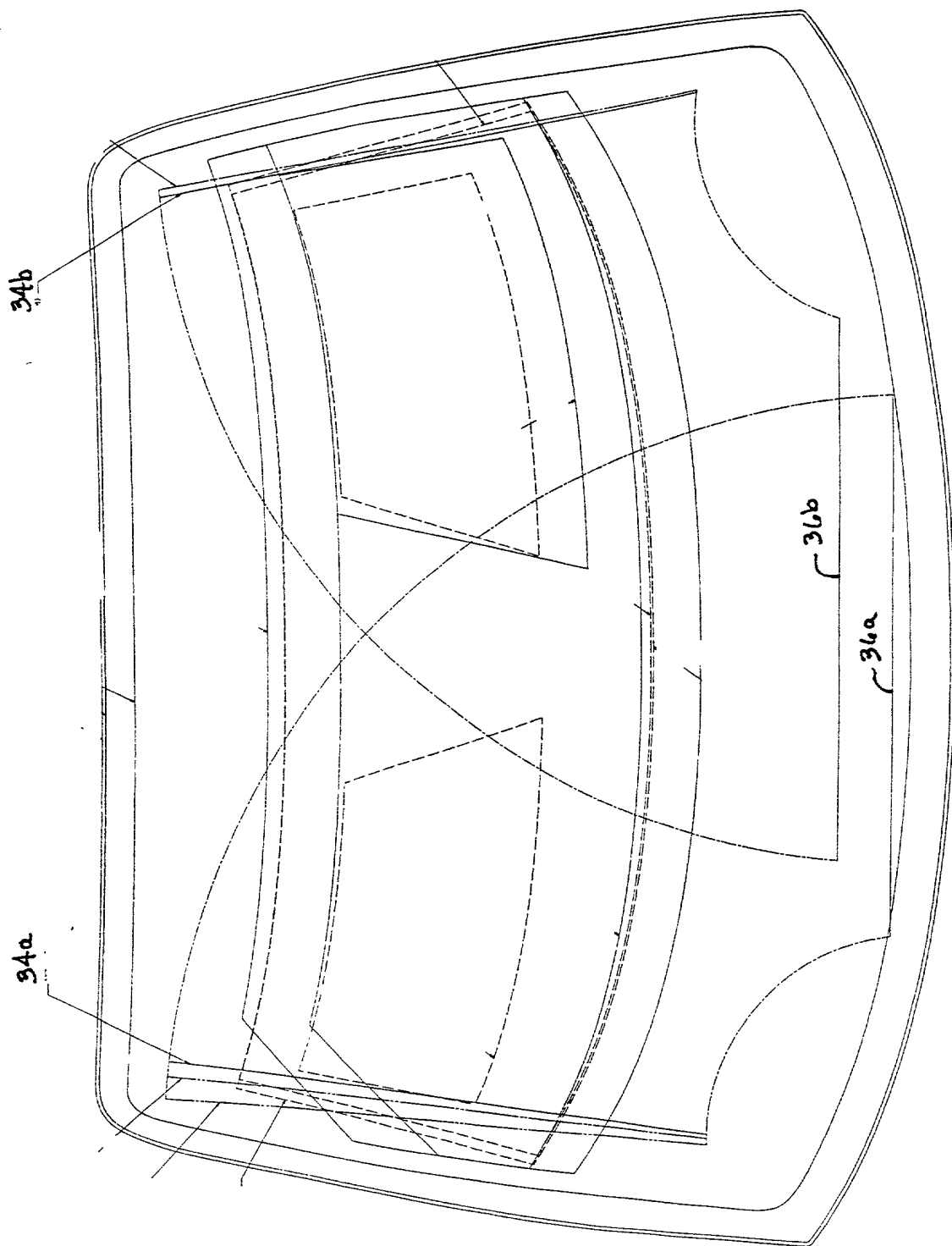
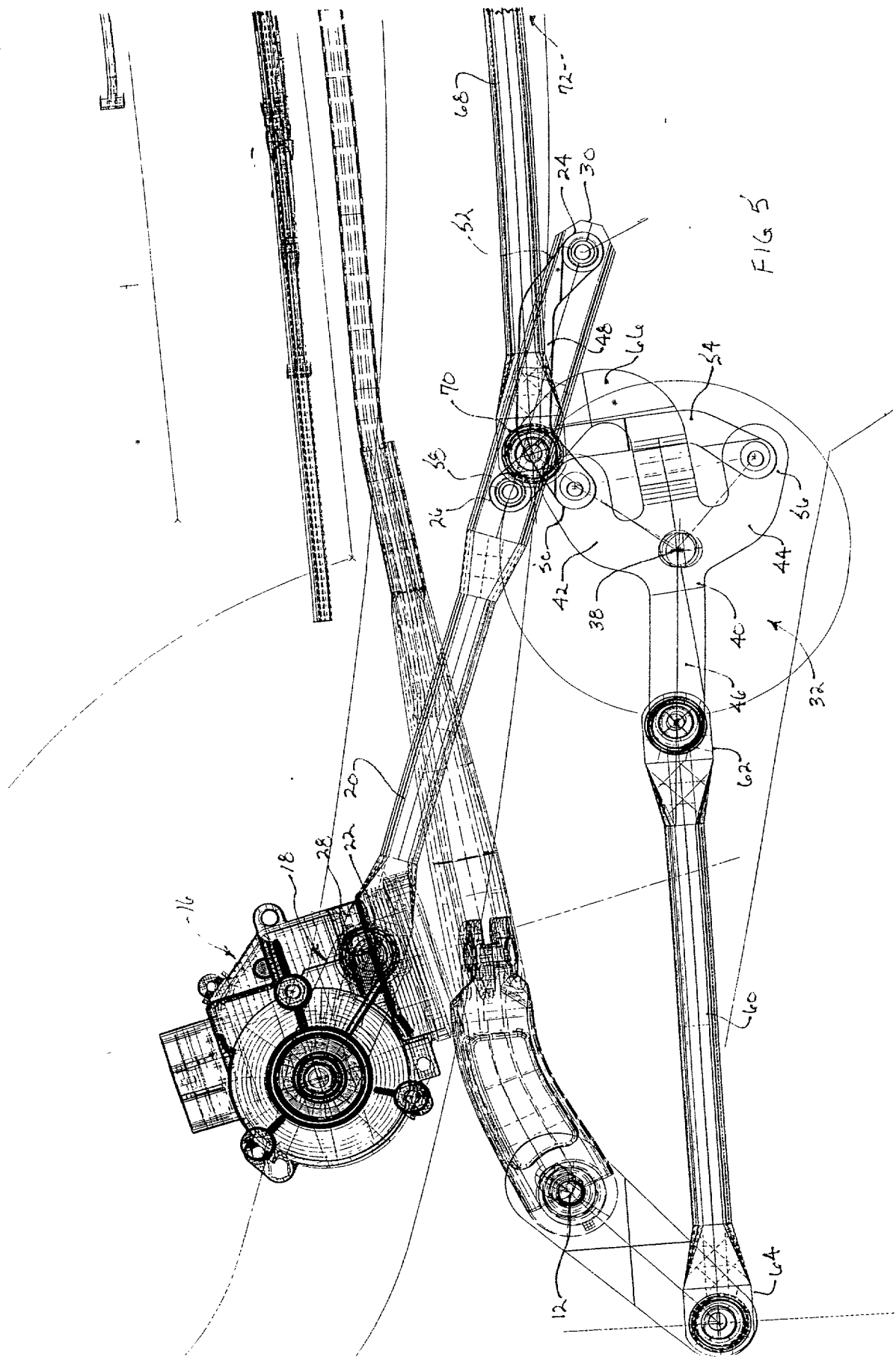
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Fig 2



File 3



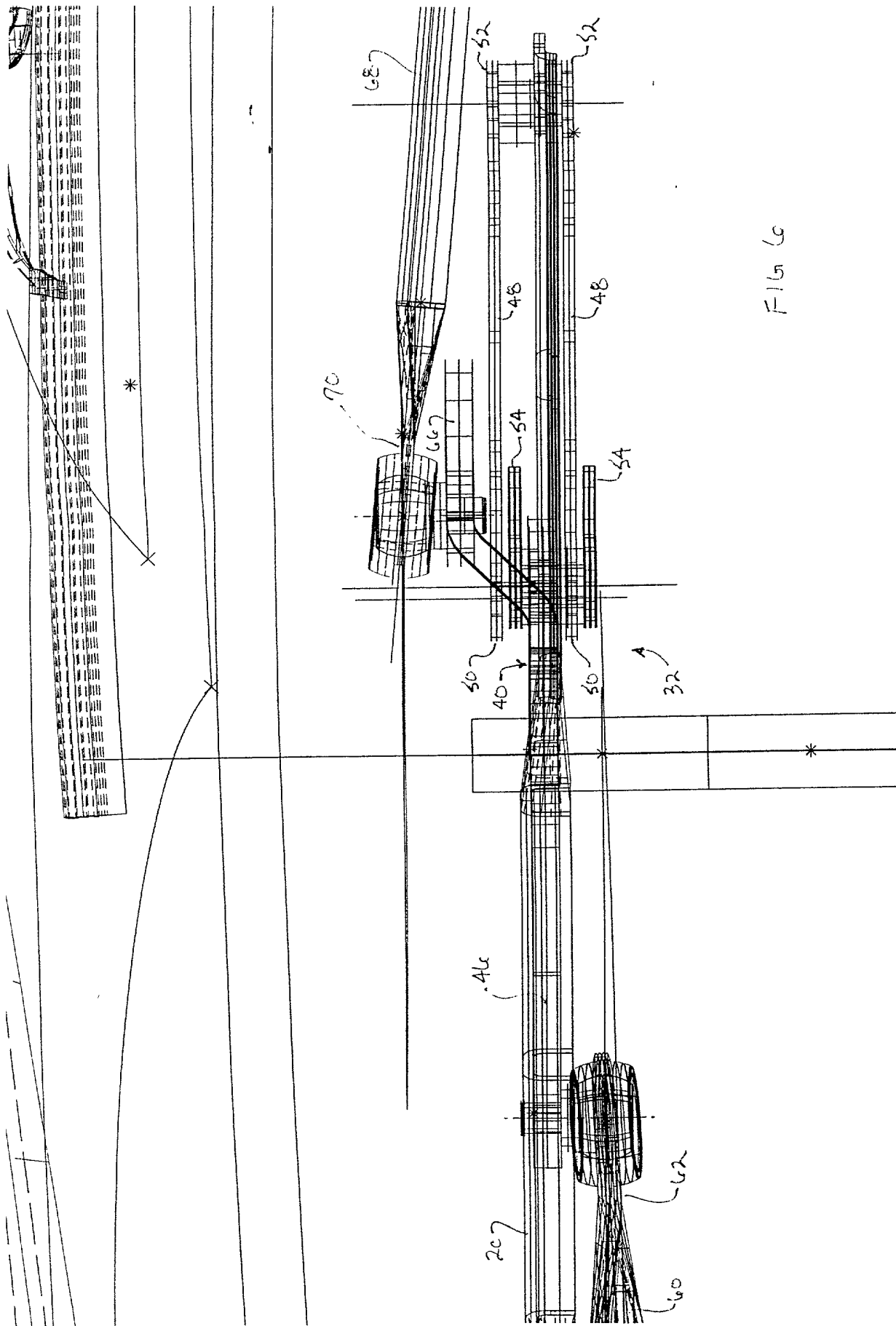


Fig 6

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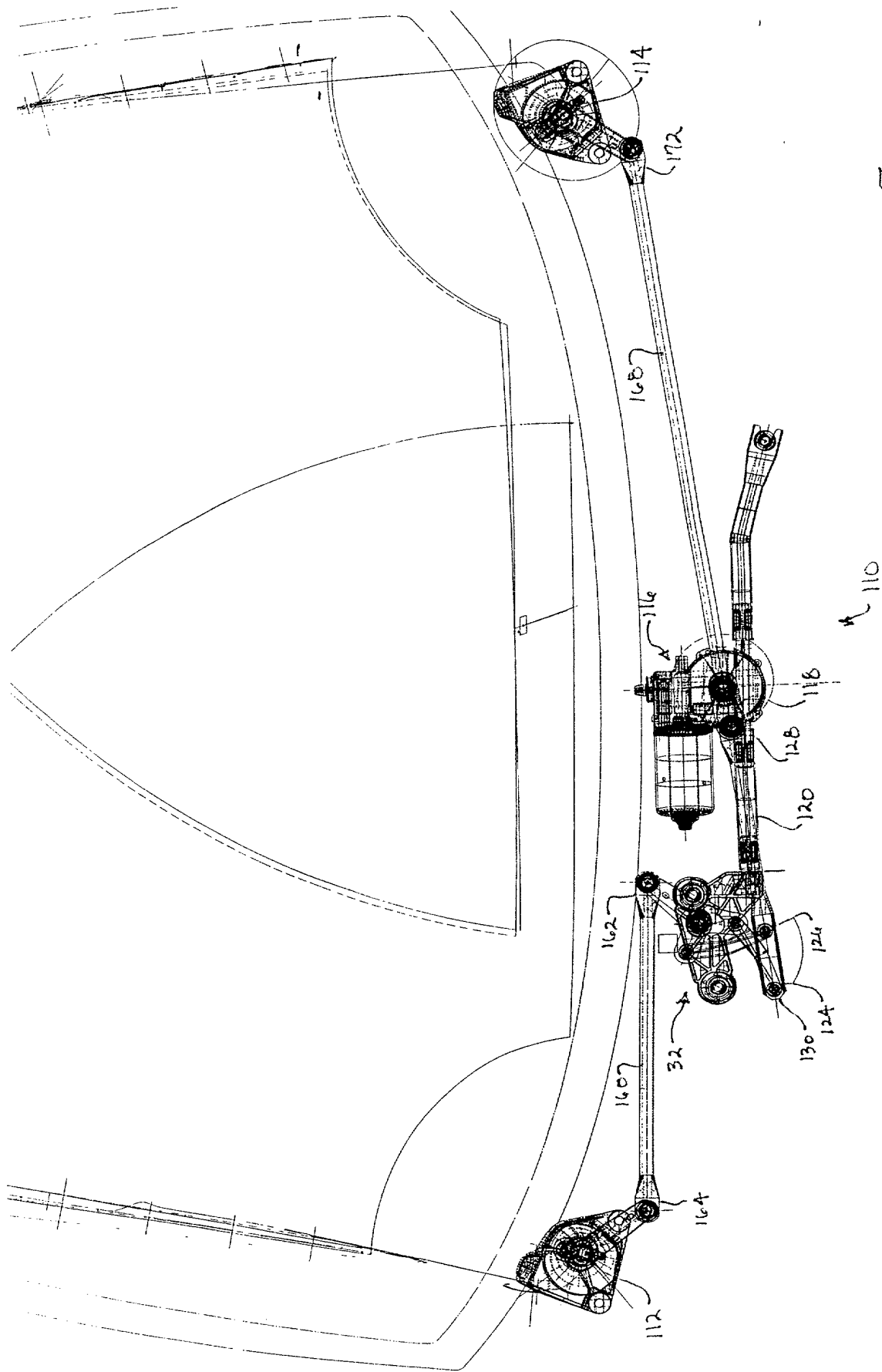


FIG 7

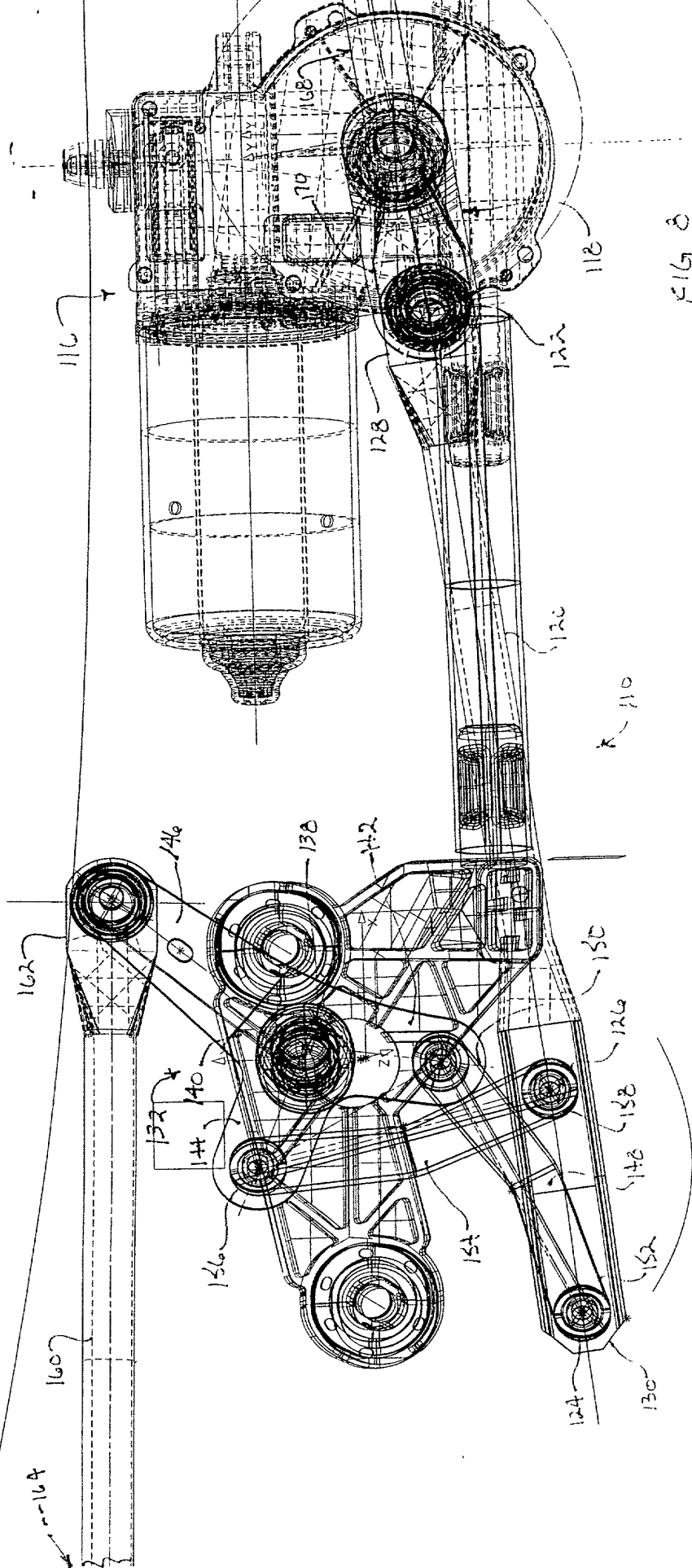
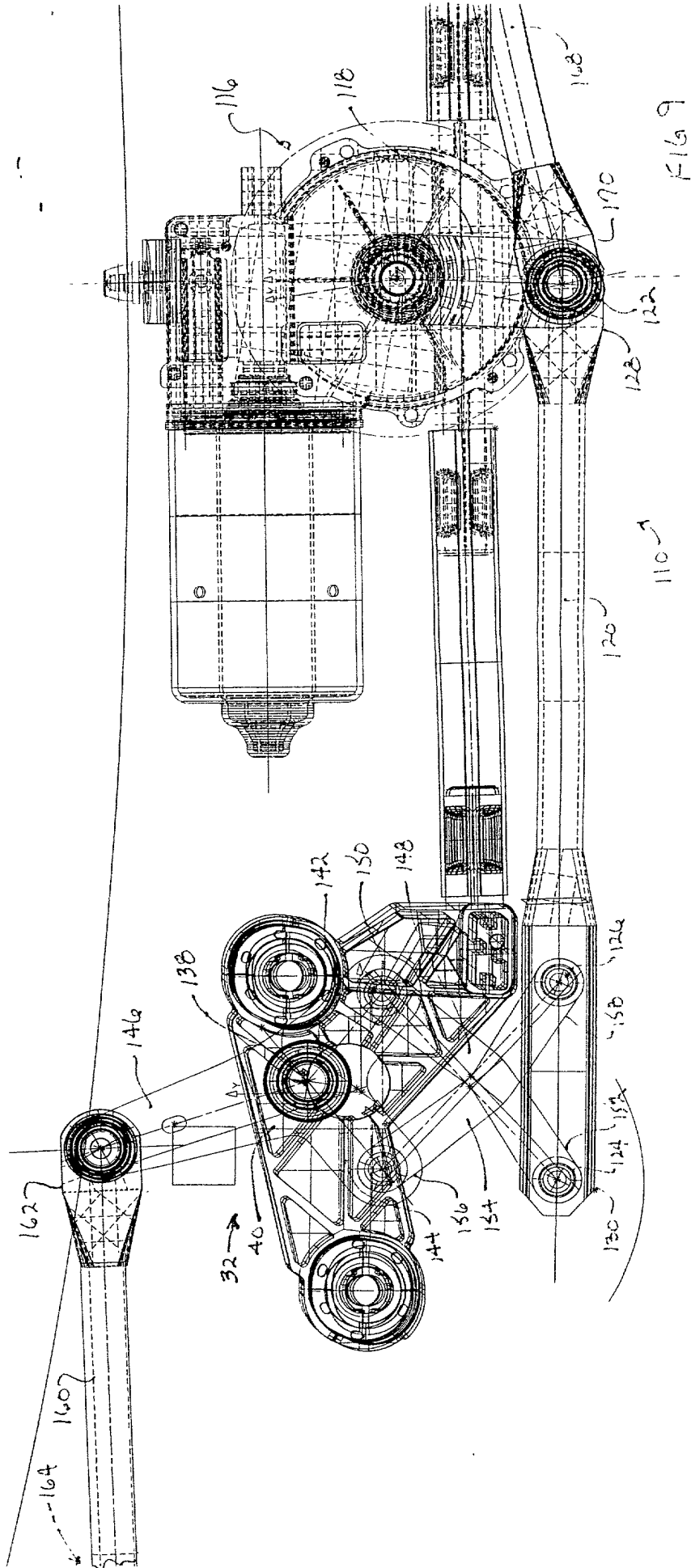


FIG. 3



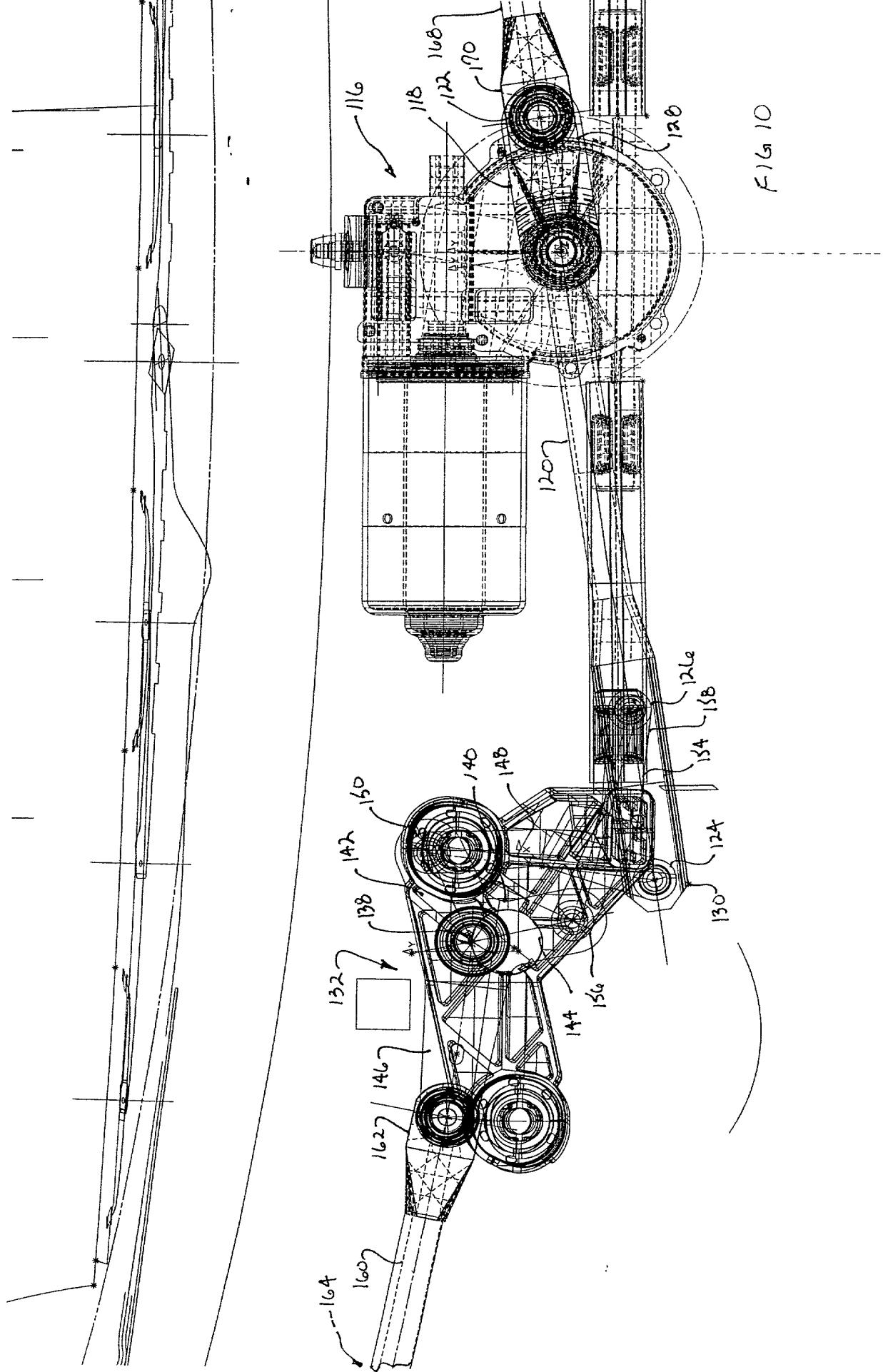


FIG 10

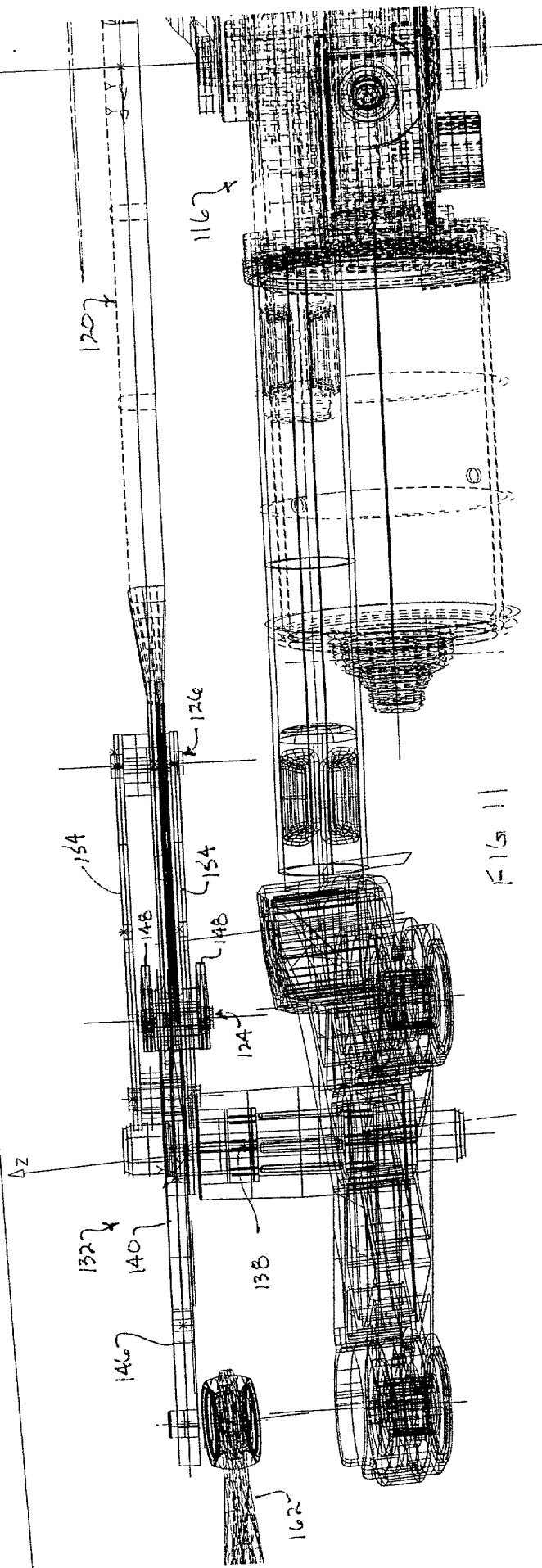
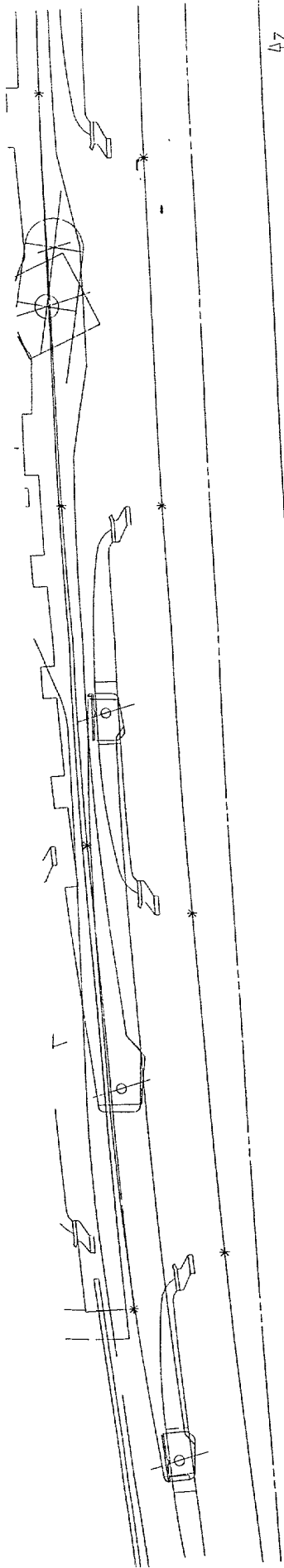


FIG 11

Our Reference: AE057 (VAL-441-A)

COMBINED DECLARATION AND POWER OF ATTORNEY**DECLARATION:**

As a below named inventor, I hereby declare that:
 My residence, post office address and citizenship are as stated below next to my name.
 I believe I am the original, first and sole inventor (if only one name is listed below) or an original,
 first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which
 a patent is sought on the invention entitled:

LOW ACCELERATION SYMMETRICAL OVERLAP WIPER SYSTEM

the specification of which (check only one item below):

☒ (X) is attached hereto.☐ () was filed as United States application Serial No. _____ on _____ and was
amended on or through _____ (if applicable).☐ () was filed as PCT International application Number _____ on _____ and was
amended under PCT Article 19 on _____ (if applicable).I hereby state that I have reviewed and understand the contents of the above identified
specification, including the claims, as amended by any amendment referred to above.I acknowledge the duty to disclose information which is material to patentability as defined in Title
37, Code of Federal Regulations, §1.56.I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of
any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s)
which designated at least one country other than the United States of America, listed below and have also
identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT
international application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign/PCT Application(s) and any Priority Claims Under 35 U.S.C. §119:

Priority Claimed

(Number)	(Country)	(Day/Mo/Yr Filed)	() Yes	() No
(Number)	(Country)	(Day/Mo/Yr Filed)	() Yes	() No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s)
listed below.

(Application Number) (Filing Date)

(Application Number) (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States
application(s) or §365(d) of any PCT international application(s) designating the United States of America,
listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the
prior United States or PCT international application(s) in the manner provided by the first paragraph of Title
35, United States Code, §112, I acknowledge the duty to disclose information which is material to
patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the
filing date of the prior application and the national or PCT international filing date of this application.Prior U. S. Application(s) or PCT International Application(s) Designating the U.S. for Benefit Under 35 U.S.C.
§120:

(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)

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I hereby appoint the following attorney(s) and/or agent(s) Gordon Lewis, Patent Office Registration No. 26735, Thomas N. Young, Patent Office Registration No. 20885, Andrew R. Basile, Patent Office Registration No. 24763, William M. Hanlon, Jr., Patent Office Registration No. 28422, Marshall G. MacFarlane, Patent Office Registration No. 30403, Donald L. Wood, Patent Office Registration No. 20014, Thomas D. Helmholdt, Patent Office Registration No. 33181, Todd L. Moore, Patent Office Registration No. 26574 and Jason J. Young, Patent Office Registration No. 34048 as my attorney(s) and/or agent(s), to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Post Office Address (Same as above)

(1) Additional inventors are being named on separately numbered sheets attached hereto.